INTEGRATED VEGETATION MANAGEMENT PLAN FOR DISTRIBUTION LINE CORRIDORS

PMP-105-ROW-2005

BC hydro

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EXECUTIVE SUMMARY

The recently enacted *Integrated Pest Management Act* and *Regulations* provides statutory authority for the use of Pest Management Plans (PMPs) on public and certain types of private land. Accordingly, vegetation management using herbicides on BC Hydro distribution line corridors requires the preparation of a PMP.

Tall-growing vegetation (target vegetation) on or near distribution corridors is a major cause of electrical outages, can create wildfires and is a public safety hazard. BC Hydro must control the vegetation under, above and near its distribution lines in order to maintain the safe, reliable and continuous distribution of electricity to its customers. Target vegetation can negatively impact both the engineering and operational components of this objective. Worker and public safety, environmental protection considerations, as well as security within the distribution corridors, are issues that must be addressed and protected while meeting the primary objective.

BC Hydro will utilize the principles of integrated pest management to manage target vegetation. Regular inspections of the distribution system shall be conducted to determine the physical location of hazard trees and vegetation clearance requirements. Where possible, vegetation that could grow, or is expected to fall onto distribution lines shall be removed. If removal is not possible, adherence to required clearances shall be achieved by the methods described in this PMP. The vegetation management practices discussed in this PMP include manual and mechanical, cultural, biological and chemical (herbicides), as well as the selection criteria used to decide which technique or combination of techniques will be utilized.

When vegetation management involves the use of herbicides, caution shall be exercised when working around bodies of water, water intakes and wells (domestic and agricultural), environmentally sensitive areas, and areas where food for human consumption is grown or found. Pesticide-free zones, no treatment zones and buffer zones will be established and maintained adjacent to the above areas, where required.

SECTION 1 INTRODUCTION

1.1 BC HYDRO PEST MANAGEMENT PLAN FOR DISTRIBUTION CORRIDORS

BC Hydro distributes electricity produced by several hydroelectric and other facilities to the majority of BC's population. Hydroelectric plants consist of a dam, a reservoir, a powerhouse and a switchyard. At each hydroelectric plant, water from a reservoir flows into the powerhouse. The flowing water turns turbines (rotating blades) which in turn drive generators. The generators convert the turbine's mechanical energy into electrical energy. Transformers located within switching stations convert the generators' low-voltage electricity into a higher voltage (greater than 60,000 volts) which is then transmitted over long distances via transmission lines. Transmission lines terminate at substations, which contain transformers that reduce the voltage of the electricity. The electricity is then distributed to BC Hydro customers via approximately 55,000 km of distribution lines (less than 60,000 volts).

BC Hydro is responsible for the safe and efficient movement of electricity from the point at which it leaves the substations until it reaches its customers through distribution lines.

1.1.1 Responsibility for Vegetation Management

Within BC Hydro, the principal contact for information relating to this Pest Management Plan ("PMP") is Rene Roddick, Vegetation/ Pest Biologist. Mr. Roddick can be contacted at 604-543-1533

1.2 GEOGRAPHIC BOUNDARIES OF THE AREA TO WHICH THIS PEST MANAGEMENT PLAN APPLIES

This PMP, hereafter referred to as an Integrated Vegetation Management Plan ("IVMP"), applies to BC Hydro's vegetation management program on distribution line corridors (including their access roads), helipads throughout its service area, as well as contracted obligations for third party maintenance circuits. The BC Hydro service area encompasses all of British Columbia. Excepted areas include the City of New Westminster, and those areas of the Kootenays and Boundary between Creston and Rock Creek, the Similkameen Valley and the Okanagan Valley from the Canada / U.S. Border north to and including the City of Kelowna. Attached hereto and marked as Schedule 1 is a copy of a map depicting the geographic boundaries of the area to which this IVMP applies.

1.3 INTEGRATED VEGETATION MANAGEMENT PLAN LEGISLATION

An IVMP is a plan that describes:

- a program for managing vegetation populations or reducing damage caused by vegetation, based on integrated vegetation management; and,
- the methods of handling, preparing, mixing, applying and otherwise using herbicides within the program.

The *Integrated Pest Management Act* (the "IPMA") and the *Integrated Pest Management Regulation* ("IPMR") require pesticides to be used pursuant to the principles of Integrated Pest Management ("IPM") which requires the development of an IVMP and the use of pesticides in accordance with the terms and conditions of the IVMP, the IPMA and the IPMR.

1.4 ROLE AND TERM OF THIS IVMP

The IVMP permits BC Hydro to utilize pesticides, in certain situations, on distribution line corridors within its operating areas. The IVMP shall be in force for a five-year period from the date that the pesticide use notice has been confirmed. BC Hydro intends to submit a Pes[illegible] Use Notice to the BC Ministry of Water, Land and Air Protection ("MWALP").

The IVMP ensures the following:

- **legal accountability with the provisions of the IPMA, as well as all applicable federal, provincial and regional laws and regulations;**
- **the incorporation and use of the principles of IPM; and,**
- **public awareness of BC Hydro's distribution vegetation management program.**

1.5 PURPOSE AND OBJECTIVES OF THIS IVMP

The primary purpose in developing this IVMP is to provide a single document which describes BC Hydro's planning processes using the principles of IPM, that will ensure effective vegetation management while protecting environmental and human health values.

The primary objective of this IVMP is to assist BC Hydro in providing a safe, reliable, and continuous supply of electrical power to its customers. Tall-growing vegetation near distribution lines is a major cause of electrical outages and can create wildfire and other public safety hazards. BC Hydro must control the vegetation under, above and near its distribution facilities through a vegetation management program in order to maintain safe, reliable distribution of electricity to its customers. Unwanted vegetation can negatively impact both the engineering and

operational components of this objective. Worker and public safety, environmental protection considerations, as well as security within distribution corridors, are issues that must be addressed and protected while meeting the primary objective.

BC Hydro shall employ an integrated approach to vegetation management on its distribution line corridors. Practices commensurate with professional IPM to manage unwanted vegetation shall be used. Regular monitoring of the system will be conducted to determine the physical location of hazard trees and general brush clearance requirements. Wherever possible, vegetation that could grow, or threatens to fall into distribution lines shall be removed. If removal is not possible, adherence to required clearances will be achieved by the methods described later in this IVMP. The vegetation maintenance practices discussed in this IVMP shall include manual, mechanical, cultural, biological and the selective use of herbicides.

SECTION 2 INTEGRATED VEGETATION MANAGEMENT

2.1 INTRODUCTION

In the context of this document the term Integrated Vegetation Management (IVM) will be used to describe vegetation management using the principles of IPM.

This section pertains to the managing of vegetation on BC Hydro distribution line corridors using the principles of IVM. Vegetation includes all plant life, including grasses, sedges, forbs, vines, ferns, brush and trees. Trees are further divided into hardwoods (deciduous) and conifers. BC Hydro is primarily concerned with the control of brush, vines, shrubs and trees which is described in greater detail later in this section.

2.2 OBJECTIVES OF BC HYDRO'S VEGETATION MANAGEMENT PROGRAM

BC Hydro's distribution vegetation management program objectives are to:

- ensure vegetation management practices and procedures are safe, practical, effective and cost efficient;
- utilize appropriate technologies;
- integrate vegetation management information with an geographical information system (GIS);
- ensure public awareness and maintain an education program related to vegetation management;
- pursue partnership opportunities with various resource experts;
- identify and quantify maintenance requirements;
- utilize a hazard tree rating and removal system; and,
- consider alternative uses of its corridors, thus, reducing the need for vegetation management.

2.3 INTEGRATED VEGETATION MANAGEMENT (IVM) PROCESS

The six elements of the BC Hydro IPM program are:

1. **prevention (planning)**
2. **pest identification**
3. **monitoring program**
4. **injury thresholds and treatment decisions**
5. **treatment options and selection criteria**
6. **post-treatment evaluations**

Each of the above IPM elements form an integral part of the BC Hydro distribution line and corridor vegetation management program and are discussed in detail below.

2.4 PREVENTION (PLANNING)

For a number of years, BC Hydro has been actively involved in gathering information in order to carry out long range planning for its distribution vegetation management program. This information has been derived from vegetation inventory surveys and from the results of inspections / patrols of distribution lines by BC Hydro staff and Contractors.

2.4.1 Initial Clearing for New Construction

Initial clearing of vegetation for distribution lines establishes future vegetation management activities and associated costs. Due consideration must be given to long-term management costs, even if this entails an increase in initial capital costs.

The vegetation management objective will be to eliminate all tall-growing tree species from new distribution line corridors, and to remove any hazard or problem trees that are outside the corridor, prior to construction. Throughout the BC Hydro service area, the emphasis will be to remove those tree species that can grow to heights that will allow them to make contact with energized conductors. In the case of deciduous species, herbicide treatment of the stump may also be required to reduce re-sprouting or suckering. Whenever possible, tall-growing species may be selectively removed (and treated with herbicide if deciduous), leaving low-growing species intact.

When a distribution line is planned over top of trees that are not compatible, consideration will be given to replanting trees which will not exceed 6 metres in height at maturity. A list of ornamental trees and shrubs which are compatible with distribution lines can be found in a BC Hydro publication entitled *Planting Near Power Lines – A Guide to Trees Recommended for Planting and Growing Near Power Lines*.

2.4.2 Long Range Plans

BC Hydro develops 20-year vegetation management plans. Planned activities are based on a cyclical rotation of work areas. This plan is used to optimize the length of the maintenance cycle as well as to estimate future budget requirements.

Establishing Work Management Areas

- It is BC Hydro policy to plan vegetation management activities on a cyclical basis in specific work management areas. In a cyclic control program, the total work is divided into yearly sections, which are based on vegetation growth rates, person-hours required and costs. The cycles are generally fixed between 2 to 5 years, but

a continuous improvement process is used to extend the cycle.

There may be limitations to obtaining the desirable clearance distances due to such things as unusual terrain features, riparian areas or customer sensitivities. In these cases, alternative control methods or shortening of cycle intervals may have to be considered.

2.4.3 Annual Workload Reviews

These workload reviews are an additional planning tool that supplements the information obtained from the long range plans. Qualified BC Hydro personnel conduct these workload reviews.

2.4.4 Hazard Tree Inventories

Identification of hazard trees on the BC Hydro distribution system is a critical and ongoing activity. The criteria to be used for determining the hazard tree priority rating and to undertake a tree defect evaluation are based on tree species, type and severity of defect and the location of the target tree.

2.5 PEST IDENTIFICATION

The accurate identification of target vegetation on, or adjacent to, BC Hydro distribution line corridors is important for these reasons:

- control may or may not be required, depending on vegetation growth rates, characteristics, and their physical location;
- control methods may differ depending on the plant species. Some may be easily controlled by non-chemical methods, but others may only be effectively managed through a combination of non-chemical and chemical methods (e.g., certain deciduous tree species are best controlled by manual cutting followed by the application of a herbicide to the freshly cut stump to stop re-sprouting).

As was noted in the introduction to this section, vegetation maintenance is primarily concerned with the control of shrubs and trees growing on or adjacent to, BC Hydro distribution line corridors. As a group, shrubs and trees are commonly referred to as woody plants.

For vegetation management, it is important to have a basic understanding of plant and tree biology, including knowledge of growth stages, life cycles and classification so that, the safest, most appropriate and effective control methods may be used.

2.5.1 Vegetation Categories

The three major categories of vegetation encountered along and adjacent to BC Hydro distribution line corridors are:

- desirable vegetation;
- target vegetation (i.e., trees and shrubs impacting lines); and,
- hazard trees.

2.5.1.1 Desirable Vegetation

Desirable vegetation is vegetation which, when mature (either due to its maximum growth height or to its proximity to the lines, or a combination of both reasons), will never come into contact or interfere with the distribution system or the overhead conductors. This grouping includes ferns, grasses, sedges, forbs and low-growing shrubs and trees.

The vegetation management approach to all desirable vegetation is to encourage its retention and propagation. The presence of appropriate low-growing vegetation inhibits the growth of the less desirable species.

2.5.1.2 Target Vegetation

Target vegetation includes; vines, trees, or shrubs growing on and adjacent to BC Hydro distribution corridors which are likely to grow into or fall onto overhead conductors before the next regularly planned maintenance cycle.

Target vegetation includes the following:

Vines
Vines are broad-leaved plants that can be either woody or herbaceous. Vines, however, often have persistent woody stems. They easily invade weed-free areas. They can climb utility poles and signs, and can severely reduce access to structures on corridors. For these reasons, control of vines may sometimes be necessary. Most vines are perennials but a few are annuals.

Woody Plants (Shrubs and Trees)
Woody plants are those that form secondary tissues from the vascular cambium (wood). Woody plants include shrubs and trees. Shrubs are woody plants that have several stems, while trees are woody plants that usually have a single stem.

There are numerous publications that will assist in the identification of unwanted vegetation.

Hazard Trees

Hazard trees are trees which demonstrate a potential to fail, and subsequently have the tree (or a branch or limb of the tree) fall onto, come in contact with or otherwise damage the BC Hydro distribution system.

2.6 MONITORING PROGRAM

BC Hydro staff and Contractors monitor target vegetation, including hazard trees, on a regular basis. BC Hydro believes that monitoring of potential target vegetation through regular inspections and line patrols is an essential planning and prevention tool. The results of the monitoring inspections / patrols are used to determine what action is required, if any, to reduce the possibility of vegetation coming into contact with distribution lines and thereby creating a safety hazard.

Monitoring consists of an ongoing assessment of sites. Its objective is to watch for potential problems that may require treatment, and to document target vegetation cover and presence of other pests.

Monitoring of corridors provides a record of information about target vegetation occurrence, density, and site conditions. Monitoring is done visually and critical observations are recorded. All sites shall be assessed before treatment decisions are made.

Sites are monitored based on a rotational cycle. This cycle is determined by species composition, projected growth rates and clearances from energized electrical apparatus. Cycles may range from one to five years.

Using its own internal standards, BC Hydro will maintain site integrity by routinely inspecting and monitoring corridors for potential or existing vegetation problems. Urgent public safety or system integrity threats will be dealt with immediately.

2.7 INJURY THRESHOLDS AND TREATMENT DECISIONS

In the case of electrical corridors, where there is no tolerance for any vegetation that could contact lines or cause a disruption in service, the generally accepted model for injury threshold based on percentage surface vegetation cover is not applicable. The decision to initiate treatment is based solely on the presence of target vegetation that has the potential to grow into or fall onto distribution equipment. Treatment decisions may also consider public safety, species growth rates, social, economic and environmental considerations.

2.8 TREATMENT OPTIONS AND SELECTION CRITERIA

IPM involves the use of different techniques to control undesirable vegetation on BC Hydro distribution line corridors. The selection of a particular technique will depend on:

- timing;
- site characteristics including land use, proximity to water sources, bodies of water, biogeoclimatic zones, soil type, and other environmental features;
- environmental sensitivities in surrounding areas;
- vegetation species;
- safety, security, economic impacts and site accessibility; and,
- the consequences of not treating.

The IPM techniques proposed for the control of target vegetation on, or adjacent to BC Hydro distribution line corridors include:

- manual and mechanical;
- cultural (natural);
- biological; and,
- chemical (herbicide) methods.

2.8.1 Manual and Mechanical Methods

The following information gives a complete listing of all currently available manual and mechanical techniques and tools. As new methodologies are developed, BC Hydro will consider adopting them.

The types of manual and mechanical methods which BC Hydro may employ for target vegetation management include:

- pruning;
- tree removal;
- stump grinding;
- caping;
- girdling;
- slashing;
- mowing; and,
- grooming.

Mechanical clearing uses blade, bucket and backhoe equipment, either on track or rubber tires. Manual clearing methods involve the use of hand-operated clearing methods and equipment such as handsaws and machetes. The method or methods

chosen depends on factors such as terrain, safety and economics.

BC Hydro shall evaluate, select and combine the methods that best suit the vegetation management site. Specific techniques are not always appropriate for use in every region or situation. In addition, the exclusive use of manual and mechanical methods to control some target vegetation species often provides only temporary control, and may compound the problem by encouraging multi-stem regeneration.

Information on the decision-making process used to determine which method or methods may be used on a specific site is discussed later in this IVMP.

2.8.2 Cultural (Natural) Control

There is an increasing demand from the public to encourage natural vegetation on BC Hydro distribution corridors. Where appropriate, BC Hydro shall actively encourage the establishment of suitable low-growing vegetation to replace tall-growing species.

Replanting with appropriate, low-growing vegetation can be an effective vegetation management technique, particularly in small areas with high public exposure, or in riparian habitats or shelterbelts. Where plant competition is feasible on a distribution corridor, manual, mechanical and chemical control techniques that enhance compatible vegetation shall be carefully selected.

In rural or wilderness areas, the use of plant species that are already present in the natural flora will be encouraged. Compatible uses such as rangeland, agricultural crops, pasture and nurseries shall also be considered. The cultural practices of these compatible uses usually eliminate incompatible plant species.

2.8.3 Biological Control

Biological control is the reduction or suppression of unwanted organisms by introducing or enhancing the presence of natural enemies. With respect to vegetation management, biological control involves the introduction and establishment of organisms from the target vegetation's native habitat to control it. There is currently a fungus that has been used successfully as a biological control agent for target species. There are no insects currently available which control the woody species that are target vegetation on distribution corridors.

A fungus, *Chondrostereum purpureum,* is an experimental biological control agent used to control target deciduous trees and shrubs. This fungus is a primary invader of wounded deciduous trees. It works over a period of one to two years by slowly killing the tree and shrub. It is being tested on deciduous trees that are prone to re-sprouting.

Initial results on red alder are promising, but additional research is required. This fungus offers several benefits in that it is non-toxic to humans and animals, it affects only the plant to which it is applied (so there is no danger of contaminating bodies of water), it can be used in pesticide-free zones and will not kill desirable vegetation such as grass. It is applied to cut stumps in a paste formulation.

2.8.4 Chemical Controls (Herbicides)

Chemical control involves the use of herbicides to inhibit growth of vegetation on or adjacent to BC Hydro distribution line corridors. Herbicides are an important tool in integrated vegetation management.

The factors that must be considered when using a herbicide are:

- soil residual activity;
- mode of action; and
- selectivity.

2.8.4.1 Soil Residual Activity

The term residual refers to having an effect for a period of time after application. Herbicide active ingredients are classified as having low soil residual activity, moderate soil residual activity, or long soil residual activity. Glyphosate, 2,4-D, and triclopyr have low soil residual activity, lasting less than 50 days in the soil. Picloram has long soil residual activity, lasting 3-5 years in the soil.

2.8.4.2 Mode of Action

A herbicide's mode of action refers to the way in which it affects a plant. Uptake of herbicides is by plant roots, foliage, or stems. Herbicides used within this PMP are carried along with other nutrients throughout the plant where they disrupt plant growth processes.

2.8.4.3 Selectivity

Herbicides that control all vegetation are termed non-selective while those that are effective in controlling certain types of vegetation are termed selective. Triclopyr, 2,4-D and picloram selectively control broad-leaved vegetation. Glyphosate is non-selective.

2.8.4.4 Use Patterns of Active Ingredients Proposed for Vegetation Management

Glyphosate – is used to control a variety of vegetation. It is effective for treating vegetation that has germinated, emerged above the soil, and is actively growing at the time of spraying. It is most useful in areas where low soil residual activity is required because of the close proximity of wells, bodies of water and other environmentally sensitive features. Glyphosate can also be used to control individual trees or stems if applied to, or injected into, cut surfaces on stems and stumps. It may be used following manual and mechanical control methods; to areas where physical controls are not practical or feasible, or by application to, or injection into, cut surfaces on stems and stumps of deciduous vegetation to prevent re-sprouting. Glyphosate may also be used for foliar applications to control patches of target deciduous vegetation.

Triclopyr - may be used to selectively control target vegetation that will encroach within the clearance limits of distribution lines. It is applied as a basal bark and foliar treatment. It is particularly effective in controlling trees that commonly re-sprout following cutting. Triclopyr is absorbed by both leaves and roots and readily moves throughout the plant. For control of maple, birch and aspen, it is more effective than glyphosate. Triclopyr can also be used to control individual trees or stems if applied to stems and stumps. It may be used following manual and mechanical control methods, to areas where physical controls are not practical or feasible, or by application to stems and stumps of deciduous vegetation to prevent re-sprouting. Triclopyr may be used for foliar applications to control patches of target deciduous vegetation.

2,4-D - is used for the spot treatment of young, actively growing target vegetation. It will control many deciduous species including alder, aspen, birch, willow, poplar and cottonwood. 2,4-D will generally be used in combination with the active ingredient, picloram, in the product Tordon 101. Because it is a selective herbicide, it is useful in areas where grasses are to be retained on the site. It may be used following manual and mechanical control methods; to areas where physical controls are not practical or feasible, or by application to stumps of deciduous vegetation to prevent re-sprouting. 2,4-D or products containing 2,4-D may be used for foliar applications to control patches of target deciduous vegetation.

Picloram - is a selective, residual herbicide used for target vegetation. It is effective for treating target vegetation that has germinated, emerged above the soil and is actually growing at the time of application. Under this IVMP, products containing picloram may be applied to the foliage and stumps of target deciduous vegetation. It may be used following manual and mechanical control methods; to areas where physical controls are not practical or feasible, or by application to stumps of deciduous vegetation to prevent re-sprouting. Products containing picloram may be used for foliar applications to control patches of target deciduous vegetation. Picloram is sometimes combined with 2,4-D to increase the range of target vegetation (Tordon 101). Picloram is best utilized in areas with hard to control species especially in grassland areas as it does not control grasses.

2.9 POST– TREATMENT INSPECTIONS AND EVALUATIONS

Qualified Contractors shall be in possession of a valid BC Pest Control Service Licence to undertake all applications of herbicides for vegetation management under this IVMP.

All contract work will be inspected / evaluated to ensure:

- compliance with commitments made in this IVMP;
- compliance with the *Integrated Pest Management Act and Regulations;* and,
- the efficacy of the work that has been undertaken by the contractor.

2.9.1 Inspections

BC Hydro shall inspect the work carried out under this IVMP during the period of contract activity. Each contractor's work shall be inspected to assess public and worker safety, environmental concerns, completion schedules and adherence to standards, specifications and the commitments made in this IVMP. Where herbicides have been applied, BC Hydro staff certified and qualified to undertake assessments will complete a customized inspection form entitled *Pesticide Contract Inspection Report.* Many of the items identified in the inspection form have been derived from standards contained in the *Integrated Pest Management Act and Regulations.* Inspections are documented and deficiencies and problems are recorded in the *Contractor Performance Information System,* a database maintained by BC Hydro.

2.9.2 Evaluations

Pre- and post-treatment evaluations are a more formal process than an inspection. Pre-treatment evaluations will be conducted to monitor site conditions and to ensure that the proposed treatment is the most effective for the targeted vegetation. Treatment timing is especially important if herbicides will be used. The effectiveness of many herbicides depends on the growth stage and condition of the target plants. Ensuring that herbicide applications are as effective as possible will help reduce the need for future herbicide use at a site. Post-treatment evaluation is undertaken to determine the effectiveness of the vegetation management program. Evaluation results are used to revise site prescriptions and to provide the basis for improvements and changes to the vegetation management process.

When evaluating the results of a herbicide application on a site, BC Hydro shall consider the following:

- effectiveness of the herbicide treatment in controlling the target vegetation;
- the need for follow-up treatments;
- the amount of herbicide used;
- the need to adjust application rate;
- the cost-effectiveness of the treatment program; and,
- any impact of the herbicide application on the surrounding areas.

The timing and procedure for evaluating specific treatment programs will depend on the treatment method. BC Hydro shall take reasonable efforts to ensure that treatment sites are evaluated within one year of the treatment.

Treatment program evaluations shall be based on visual estimates as conducted by Regional Vegetation Coordinators, Vegetation Specialists, Regional Vegetation Pest Biologists, or others qualified and experienced to undertake the evaluations.

SECTION 3 OPERATIONAL INFORMATION

3.1 QUALIFICATIONS FOR PERSONS APPLYING HERBICIDES

The transportation, storage, handling, application and disposal of herbicides are governed by federal and provincial legislation. BC Hydro shall follow safe handling practices including workplace requirements for Workplace Hazardous Materials Information System (WHMIS) labeling and worker education. The required practices for pesticide applicators are detailed in:

- Worker's Compensation Board of British Columbia (1998) *Occupational Health and Safety Regulation – BC Regulation 296/97 as amended by BC Regulation 185/99 – Sections 6.70 to 6.109;*
- BC Ministry of Environment, Lands and Parks (1995) *Handbook for Pesticide Applicators and Dispensers*; and,
- Workers' Compensation Board of British Columbia (1990) *Standard Practices for Pesticide Applicators.*

Any individual or company (i.e., a Contractor) that provides a service to BC Hydro by applying commercial or industrial herbicide must have a valid BC Pest Control Service Licence, and each supervising applicator must have a valid BC Pesticide Applicator Certificate in the Industrial Vegetation and Noxious Weed Control or Forestry General or Forestry Non-Broadcast categories.

Under the *Integrated Pest Management Act and Regulations*, a certified pesticide applicator can supervise up to four uncertified assistants, provided the assistants are within continuous auditory or visual range at all times while applying herbicides. Individuals must carry proof of their applicator certification with them when applying herbicides for inspection purposes.

3.2 PROCEDURES FOR SAFELY TRANSPORTING HERBICIDES

The transportation of herbicides shall comply with all current federal and provincial legislation governing their transport. In addition, the following procedures will be followed while herbicides are being transported for application under this IVMP:

- limited amounts of herbicides will be carried in any one vehicle. The quantity shall be no more than what is necessary for each project, except where transportation occurs between storage facilities;
- herbicides shall be carried in a secure compartment;
- herbicides shall be transported in original labeled containers;

- herbicides shall be transported in a separate compartment from food and drinking water, safety gear, spill containment equipment and people;
- appropriate documents such as Pest Control Service Operations Records, Material Safety Data Sheets (MSDS) and the IVMP document shall be available during transport and use of herbicides;
- all documents and placards shall be carried in, or placed on, transport vehicles if required under the *Transportation of Dangerous Goods Act* or the IPMA; and,
- all herbicide containers shall be inspected for defects prior to transporting, and shall be secured against spillage or unauthorized removal.

3.3 PROCEDURES FOR SAFELY STORING HERBICIDES

Herbicides will be stored at BC Hydro's herbicide storage facilities or those managed by its Contractors. BC Hydro-owned facilities and those managed by the Contractors shall comply with the storage requirements described below.

Herbicides will be stored in accordance with the *Integrated Pest Management Act and Regulations* and the Workers' Compensation Board document *Standard Practices for Pesticide Applicators.*

In summary, the storage area must:

- be ventilated to the outside atmosphere;
- be locked when left unattended; and,
- be entered only by persons who are authorized to do so; and,
- have a placard affixed and maintained on the outside of each door leading into the facility in which the herbicides are stored bearing, in block letters that are clearly visible, the words "WARNING – CHEMICAL STORAGE – AUTHORIZED PERSONS ONLY".

In addition, the person responsible for the storage area shall notify the appropriate fire department of the presence of herbicides on the premises.

BC Hydro has no direct control of the herbicide storage practices of its Contractors while they are not under contract to BC Hydro.
Some Contractors may store herbicides for extended periods of time in vehicles when performing a number of herbicide treatments for BC Hydro. The vehicle is considered a mobile storage unit. Persons responsible for the herbicide storage shall ensure that all herbicides are stored in a locked canopy or similar arrangement, separate from the driver and personal protective gear.

3.4 PROCEDURES FOR SAFELY MIXING, LOADING AND APPLYING HERBICIDES

All mixing, loading and application of herbicides shall be carried out by certified pesticide applicators in the appropriate category of certification. Mixing of herbicides must always be conducted in a safe manner. Safety spill kits, spill response plans and first aid supplies shall be present on or near the treatment site. Eye wash station(s) and protective clothing as recommended on the respective product labels shall be available on or near the treatment site. Product labels and Material Safety Data Sheets will be available on or near the treatment site to ensure that quantities of herbicides being mixed and used are consistent with label rates. There shall be no mixing or loading of herbicides within 15 metres of sensitive environmental features.

3.5 PROCEDURES FOR THE SAFE DISPOSAL OF EMPTY HERBICIDE CONTAINERS AND UNUSED HERBICIDES

Empty containers shall be disposed of in accordance with the manufacturer's instructions as noted on the product label or provincial instructions and recommendations that are detailed in the BC Ministry of Environment, Lands and Parks document *Handbook for Pesticide Applicators and Dispensers* (1995). As a minimum, empty herbicide containers shall be:

- returned to the herbicide distributor as part of their recycling program; or,
- triple rinsed or pressure rinsed, then altered so they cannot be reused; and,
- disposed of in a permitted sanitary landfill or other approval disposal site.

3.6 PROCEDURES FOR RESPONDING TO HERBICIDE SPILLS

Spill treatment equipment shall be present or near storage (including mobile storage) mixing and loading sites, and it shall include the following:

- personal protective equipment;
- absorbent material such as sawdust, sand, activated charcoal, vermiculite, dry coarse clay, kitty litter or commercial absorbent;
- neutralizing material such as lime, chlorine bleach or washing soda; and
- long handled broom, shovel, and waste-receiving container with lid.

A copy of an approved spill response plan shall be at or near each work site. All personnel working on a project involving herbicides should be familiar with its contents. If Contractors that work under this IVMP have their own spill response plan, it must meet or exceed the

contents of this plan.

The following procedures must be followed if a spill occurs:

- all personnel shall be protected from herbicide contamination by wearing appropriate protective clothing and safety gear;
- any person exposed to a herbicide shall be moved away from the place of the spill;
- first aid should be administered, if required;
- the source of the spill should be stopped;
- the spilled material should be stopped from spreading by creating a dam or ridge;
- the project supervisor shall ensure operations cease until the spill is contained and the source is repaired;
- absorbent material shall be spread over the spill, if applicable, to absorb any liquid;
- the absorbent material shall be collected in garbage bags or containers with the contents clearly marked;
- contaminated soil or other material will be removed from the spill site and placed in garbage bags or containers;
- the person responsible for the project, shall contact the environmental coordinator at the BC Hydro Materials Management Business unit for shipping instructions and disposal requirements;
- when more than one litre of herbicide is spilled, the person responsible for the project will immediately report it to the Provincial Emergency Program by telephoning 1-800-663-3456 or, where that is impractical, to the local police or nearest detachment of the R.C.M.P.; and,
- an approved representative of the BC Hydro will be notified of the details related to the spill as soon as is practical by the Contractor project supervisor.

3.7 HERBICIDE APPLICATIONS

3.7.1 Application Equipment

Depending on the type of herbicide treatment being applied the following types of equipment may be used.

Backpack Sprayer
A backpack sprayer is a portable, manually operated, pressurized container with a nozzle for spraying herbicides. It operates under low pressure, thus minimizing the possibility of drift. Backpack sprayers may also be used for selective herbicide applications or spraying individual trees or plants. Pursuant to this IVMP, backpack sprayers may be used to selectively apply 2,4-D, picloram, glyphosate and triclopyr to deciduous stumps, single trees or clusters of deciduous trees where the vegetation is 50 cm to 1.5 metres in height. "Selective application" refers to the application of a

herbicide to target vegetation.

Hand Gun (Power Hose and Nozzle)
A hand-held spray gun and hose is attached to a portable tank filled with a herbicide solution, and is usually pressured by a power driven pump. It can be used to apply 2,4-D, picloram, glyphosate and triclopyr to foliage of target vegetation.

Wick / Wipe On Applicator
These applicators are used to selectively apply herbicide by wiping it directly onto plants. Wicks are made of rope or absorbent pads. Only small amounts of herbicide are applied, so the need for pumps, control devices and spray tanks is eliminated. Wick application is rarely used for vegetation management in distribution corridors.

Squirt Bottle / Squeeze Bottle
This applicator is usually a plastic container approximately one litre in size and is pressurized through manual means.

3.7.2 Application Methods and Techniques

Cut–And -Treat
This method, also called cut-surface treatment, will be used in conjunction with slashing in deciduous stands. With this application method, the tree is cut as low as possible to the ground, then a herbicide is applied by squirt bottle or backpack sprayer to the cut surface of the stump to limit re-sprouting. Cut-and-treat is a selective technique which removes target vegetation but retains desirable vegetation.

Capsule Injection of Stumps
In this technique, a small capsule containing the active ingredient glyphosate is injected into the stem of a target tree or stump by means of a battery-powered drill or automatic loading lance. The herbicide is slowly released into the sapwood. Capsule injection will be used when cut-and-treat cannot be done immediately after slashing. This technique is also effective on re-sprouting stumps, provided the capsules are applied to live tissue.

Hack-and-Squirt
Hack-and-squirt is a type of injection technique that involves making one or more incisions into the sapwood, and placing small amounts of the herbicide into the cuts with a squirt bottle. The cuts should be spaced evenly around the trunk, with at least one cut for each 2.5 cm of stem diameter at breast height. Herbicide is normally applied with a squirt bottle, within minutes after making the incisions.

Wipe-on Techniques
In this technique, a wick soaked with the herbicide is wiped or dragged over the foliage of the target species. The wick applicators are available in various materials and in

many sizes, from hand-operated to vehicle-mounted. This application technique virtually eliminates drift.

The wipe-on technique will generally be used where cut stumps have re-sprouted to a height that raises the undesirable vegetation over the desirable vegetation so that it may be treated safely and effectively.

Basal Bark Applications

This procedure involves treating the bark of a tree from the root collar to a point above the ground with a hand-operated backpack sprayer. The herbicide penetrates the bark into the cambium layer of target stems and diffuses throughout the tree. It also travels to the roots and prevents re-sprouting. Although most effective in the late summer, basal bark applications can be made throughout the year, except in wet weather. This technique can be used for controlling individual trees, it can also be applied to cut stumps to prevent re-sprouting and root suckering.

Foliar Applications

With this technique, a manually-operated pressurized backpack or hose and handgun is used to selectively apply herbicides. This method is generally used for individual trees or small clusters of trees. It may also be used as a touch-up for cut-and-treat treatments and to treat areas where there are many re-sprouts on stumps after mowing or slashing. It is most effective when done during periods of active growth.

SECTION 4 ENVIRONMENTAL PROTECTION STRATEGIES AND PROCEDURES

All vegetation management activities approved for use within this IVMP will incorporate measures designed to protect the following:

- strategies to protect community watersheds, and other domestic and agricultural water sources;
- strategies to protect fish and wildlife, riparian areas, and wildlife habitat
- strategies to prevent herbicide contamination of food intended for human consumption;
- pre-treatment inspection procedures for identifying treatment area boundaries
- procedures for maintaining and calibrating herbicide application equipment; and,
- procedures for monitoring weather conditions and strategies for modifying herbicide application methods for different weather conditions.

In this IVMP, BC Hydro based the size of its pesticide-free zones (PFZ) and no treatment zones (NTZ) on the standards currently contained in the *Integrated Pest Management Act and Regulations.*

4.1 STRATEGIES TO PROTECT COMMUNITY WATERSHEDS

BC Hydro's IVMP will abide by the following principles with reference to community watersheds:

- herbicides shall not be stored within a community watershed for more than 24 hours prior to their use, and removed from the community watershed within 7 days of their use, unless they are stored in a permanent structure;
- a 100 metre NTZ will be maintained upslope from all licensed water intakes within the community watershed; and,
- prior to the use of herbicides, community watershed maps will be reviewed to determine if herbicide treatments are within a community watershed or are within 100 metres upslope of any water intake. The watershed maps are generated by the MWALP and overlaid on the BC Hydro GIS mapping system.

4.2 STRATEGIES TO PROTECT DOMESTIC AND AGRICULTURAL WATER SOURCES

BC Hydro shall ensure that strategies are developed that identify and protect domestic and agricultural water sources prior to herbicide application. The table below describes the minimum water protection measures that shall be implemented for herbicide applications on BC Hydro distribution corridors.

Minimum Water Protection for Herbicide Application on BC Hydro Distribution Corridors *

All Herbicides	*Required Distance*
Domestic and agricultural wells and water intake	**30 metre NTZ****
Any body of water or stream except glyphosate	**10 metre PFZ**
Glyphosate Applications	
A body of water or stream that is fish bearing	**5 metre PFZ**
A permanent body of water that is not fish bearing at any time of the year and does not drain directly to fish-bearing waters	**2 metre NTZ**
A substation or switching station that must be maintained vegetation free for safety reasons along or around a body of water or wetland that is fish bearing or drains directly to fish bearing waters	**2 metre PFZ**
A temporary free-standing body of water that is not fish bearing and does not drain directly into fish bearing waters	**0 metre PFZ**

*All terms in the above table have the same meaning as defined in the IPMA and IPMR.
** The 30 metre NTZ from domestic and agricultural wells and water intakes may be reduced if the confirmation holder for this IVMP is reasonably satisfied that the smaller zone will ensure that herbicide from the use will not enter the water supply, intake or well.

BC Hydro shall also ensure that strategies are developed to identify and protect sources of groundwater prior to the application of herbicides by utilizing information obtained from the Groundwater Section of MWLAP and their document/data base entitled *Guide to Using the BC Aquifer Classification Maps for the Protection and Management of Groundwater.*

In addition to the above, BC Hydro shall institute the following groundwater source identification strategies, pre-job checklist and sign-off sheet to ensure groundwater protection :

- MWLAP well (and other groundwater source) locations as well as aquifer locations and

community watershed boundaries shall be plotted on a BC Hydro GIS mapping database which is merged regularly with the MWALP maps for the protection and management of groundwater;

- MWLAP Community Watershed/Aquifer Website data shall be printed and copies made available to Contractors prior to herbicide use;
- well, water intake, point of diversion and watershed information shall be discussed with applicators prior to herbicide use;
- other water course sensitive issues, including fish habitat, streams, and environmentally sensitive areas shall be discussed with applicators prior to herbicide use;
- BC Hydro staff shall ensure that applicators understand the terms and conditions of the IVMP;
- applicators shall be instructed to record well data on BC Hydro's GIS database for operations;
- if known groundwater sources cannot be located, applicators shall be instructed not to apply herbicides until a determination can be made;
- applicators shall be instructed to attempt to contact well (groundwater source) owners if known groundwater sources cannot be located; and,
- if any new well locations are discovered by the applicators they shall be added to the GIS database.

4.3 STRATEGIES TO PROTECT FISH AND WILDLIFE, RIPARIAN AREAS AND WILDLIFE HABITAT

In addition to the PFZ's specified earlier for bodies of water, BC Hydro shall exercise caution when working with herbicides adjacent to and within sensitive ecosystems including riparian and sensitive wildlife habitat.

Riparian vegetation management considerations shall include provisions to ensure there is no harmful alteration, damage or destruction to fish or their habitat. This includes procedures to minimize impact to vegetation cover, bank stability, turbidity and nutrient cycling.

In order to achieve this, contract documents and prescriptions shall describe best management practices. These will be reinforced at the office pre-job meeting (held between BC Hydro staff and contract supervisors before work begins to discuss contract specifications) as well as at field meetings between BC Hydro staff and field workers. There shall be regular inspections and in some cases, there shall be detailed and direct supervision by subject experts.

Clauses in prescription and contract documents include:

- no refueling of machinery or herbicide mixing within 15 metres of a riparian zone;
- no clean up or disposal of herbicide materials within 15 metres of riparian zones;

and,

- requirements to install descriptive flagging such as "Riparian Zone" and "Pesticide-Free Zone" placed at regulated distances.

Riparian management strategies will confer some protection to wildlife in these areas. The impact on cover which provides protection from predators, cooling/warming, nesting and roosting sites, residences, travel corridors and food sources will be minimized as in most cases, two-thirds of cover will be retained or the area will be replanted to achieve future cover and improved biodiversity.

BC Hydro shall work closely with agencies responsible for species at risk and shall rely on best management strategies as derived from documents on species habitat, lifecycle information and locations. This information shall be relayed to Contractors to ensure all involved in the vegetation management process can competently protect these species and habitats during the course of the work.

4.4 STRATEGIES TO PREVENT HERBICIDE CONTAMINATION OF FOOD INTENDED FOR HUMAN CONSUMPTION

BC Hydro distribution corridors are frequently located near environmentally sensitive areas such as lawns, vegetable gardens, berry picking and bee keeping areas and areas containing agricultural crops and domestic animals. Food intended for human consumption is sometimes grown or found within these areas.

BC Hydro shall attempt to locate areas where there is food intended for human consumption (including berries) and take the appropriate precautions during vegetation management operations to avoid contamination of these areas. Such precautions may include providing increased buffer zones around these areas during herbicide applications, timing applications to provide additional safety measures or using alternative, non-chemical methods of vegetation management.

4.5 PRE-TREATMENT INSPECTION PROCEDURES FOR IDENTIFYING TREATMENT AREA BOUNDARIES

A pre-treatment inspection shall be completed to protect environmentally sensitive areas. During this inspection, sensitive areas such as bodies of water are noted on maps. These maps are supplied to the Contractor and discussed at the pre-job. The Contractor is instructed to follow the flagging requirements, which may include the use of Riparian Zone and Pesticide-Free Zone flagging tape.

During the pre-work discussion, all crew members shall be instructed in the flagging requirements and precautions, and review the methodology and procedures for applications and handling of the herbicide.

Signs will be posted by the Contractor to meet regulatory requirements.

4.6 PROCEDURES FOR MAINTAINING AND CALIBRATING HERBICIDE APPLICATION EQUIPMENT

All herbicide application equipment used in BC Hydro property shall be safe, clean, in good repair, compatible and appropriate for the herbicide being used. As a minimum, all backpack sprayers will be calibrated once per year prior to use, and at regular intervals throughout the season when changing pesticide products and when nozzle output begins to vary. The frequency of calibration will be dictated by factors such as the formulation of herbicides used. For example, abrasive formulations will result in greater nozzle wear and will require more frequent calibrations.

4.7 PROCEDURES FOR MONITORING WEATHER CONDITIONS AND STRATEGIES FOR MODIFYING HERBICIDE APPLICATION METHODS FOR DIFFERENT WEATHER CONDITIONS

Measurements will be made to record weather conditions prior to and periodically during herbicide applications. Wind speed and direction, precipitation, temperature and sky conditions (clear, overcast, cloudy, partly cloudy) will be recorded for foliar herbicide applications using backpacks or handguns. Temperature, precipitation, frost and dew conditions will be recorded for stem, bark, wick/wipe-on and stump applications.

Herbicide application will be shut down if:

- the maximum temperature stated on the herbicide label is exceeded;
- the wind speed and/or direction cause the handgun or backpack application of herbicide to drift and/or miss the target vegetation; or,
- it begins to rain, increasing the chances of excessive runoff and leaching.

Glossary

deciduous	plants which lose their leaves during the dormant winter season (leaf loss may also be induced by drought, etc.)
habitat	a particular environment in which organisms live
herbicide	a pesticide used to control or manage weeds
inhibit	to hold in check or stop, e.g., to inhibit or check seed germination or plant growth with herbicides
integrated control	the use of more than one approach to a method of pest control, including cultural practices, natural enemies and selective pesticides
non-selective herbicide	a herbicide that is toxic to a wide range of plants, or toxic to more than one type of plant
pest	an undesirable organism
pesticide	under the *Integrated Pest Management Act*, any substance or mixture of substances, other than a device, intended for killing, controlling or managing insects, rodents, fungi, weeds and other forms of plant or animal life that are considered pests
pesticide buffer zone	A strip of land between the 10 metre pesticide-free zone and the pesticide treatment area. Pesticides are not applied directly in the pesticide buffer zone to prevent entry of pesticides or pesticide residues by drift, runoff, or leachate into the pesticide-free zone. The width of the pesticide buffer zone is up to the discretion of the pesticide applicator, who must take the type of pesticide application equipment, speed of travel, terrain topography, soil conditions and weather conditions into account.
pesticide-free zone	A strip of land, usually 10 metres in width, adjacent to bodies of water. Pesticides may not be directly applied to, or allowed to reach the pesticide-free zone via drift, runoff or leachate. Specific authorization is needed if the pesticide-free zone is to

	be less than 10 metres.
residual herbicide	products that continue to have a killing or repelling effect for a period of weeks or months after application
re-sprouting	the growth of new stems on deciduous vegetation that have been injured or where manual or mechanical control methods have been applied
riparian	the area of land adjacent to a stream, river or wetland that contains vegetation that, due to the presence of water is distinctly different from the vegetation of adjacent upland areas
riparian habitat	vegetation growing close to a watercourse, lake, swamp or spring that is generally critical for wildlife cover, fish food organisms, stream nutrients and large organic debris, and for streambank stability
riparian management zone	defined in the Forest Practices Code of BC Act Operational Planning Regulation as that portion of the riparian management area that is outside of any riparian management zone or if there is no riparian zone, that area located adjacent to a stream, wetland or lake of a width determined in accordance with Part 10 of the Regulation
selective pesticide	A pesticide which is more toxic to some types of organisms than others. Usually used to describe a particular type of pesticide, such as a selective herbicide, e.g., a selective herbicide may kill crab grass in a cornfield without injury to the corn.
selective herbicide	a herbicide that is more toxic to some species of plants than others
species	a group of living organisms which are similar in structure and physiology and are capable of producing fertile off-spring